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ABSTRACT

This study examined how children, drawn from K-6 grades in 3 primary schools in southwest Sydney, use computers in their homes and the physical and social environments within which they use them. Key issues explored were diversity of access, range of uses, and factors which influence use, including gender, age, and parental and sibling role models. The impact of home access and the use on children's perceptions about use of computers in schools was also explored. The project involved discussion groups with a total of 199 children. As part of the process of seeking permission, parents completed a brief survey of their perceptions of their child's use of a range of technologies in the home. Children who were regular users of computers (i.e., used a computer at least two or three times a week) were selected for interview. Results indicated the integration of computers into the children's lives. Ownership, location, and rules were identified as factors influencing access to computing. Playing games was the most common use, although computers were also used for other purposes including school-related activities. Parents and siblings were found to be important role models for computer use. Results of a 1994 teacher survey and a literature review are appended. (Contains 11 references.) (MES)

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ED 416 841

Children's Use of Electronic Technologies in the Home

(based on discussions with 190 K-6 children in three Sydney Metropolitan Schools)

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October 1995

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Background.

In 1994, as part of an educational computing course , seventeen graduate students who were teaching in local schools surveyed some or all of the children in their class about the technologies they have access to in their home. The method and content of the teachers investigations varied. Teachers analysed their own results, and discussed the implications of their findings in terms of policies and practices within their classrooms. In general the teachers were surprised by the high ownership of electronic technologies in the children's homes. The following table shows the degree of family ownership of a range of technologies as reported by the children. The results have been aggregated for the seventeen classes. In all, 460 K-6 students were surveyed in sixteen primary schools (two teachers were at the same school) in south west Sydney.[1]

Table 1

Family Ownership of electronic technologies

Technology	*Family Ownership*
television	99.5%
telephone	99%
VCRs	90%
video games	62%
computers	58%
printers	40%
video cameras	33%
answering machines	27%
hand-held	25%
fax machines	10%
modems	5 %

[1] A fuller description of the result and discussion from this work is presented in Appendix A

While the results of the surveys are not generalisable beyond the classrooms of this particular group of teachers, they raised a number of questions and issues that could be addressed by further research. These relate to access and ownership of the computers in the home: Who owns the computer? Where is it located? Who uses it most? and Are there any rules about its use? Other issues relate to how children use the computers in their homes and what they think about computer use.

This preliminary report presents the next stage in the research where a number of these issues were addressed.

Purpose of this phase of the study.

The purpose of this phase of the study was to more fully describe how children use computers in their homes and the physical and social environments within which they use them.

Key issues explored were diversity of access, range of uses and factors which influence use including gender, age, parental and sibling role models. As well the impact of home access and use on children's perceptions about use of computers in schools were explored.

Design and Procedures:

The project involved discussion groups with same grade children from K- 6 in three primary schools in south west Sydney. While the selected schools drew children from communities with a range of social and cultural backgrounds, they could best be described as middle class communities. As part of the process of seeking permission, parents were asked to complete a brief survey of their perceptions of their child's use of a range of technologies in the home. This survey is reproduced in Table 2

Table 2

Statements parents responded to as part of the permission process.

At home my child	Several hours a day	At least once a day	Two or three times a week	About once a week	Less than one a week	Not at all
watches television						
listens to their own music						
uses the telephone to talk to friends etc						
plays games on a Nintendo, SuperNintendo, Sega, Megadrive or other games machines						
plays games on a computer						
uses a computer for writing and /or drawing						
uses a computer for school projects and homework						
uses a computer for other purposes:..... ..... *please specify*						

Rate of return of permission notes varied between schools from about 35% to 85%. The varying response rates were not seen as a major problem as the notes were mainly used to identify regular users among the children and to provide some ability to check children's own perceptions about the frequency of their use.

The parent responses were analysed, and children whose parents indicated that they were regular users of computers were selected for interview. Regular users were defined as children who used a computer at least two or three times a week - for games and / or other purposes. A range of in-school events and child absences prevented all selected children from being interviewed but Table 3 presents the numbers of children whose parents returned

permission notes and the number of children interviewed by gender and grade groupings across the three schools.

Table 3

Numbers of children in Discussion groups and/or had permission notes

Grades	*Boys*		*Girls*		*Total*	
	Dis'n Gps	*Notes*	*Dis'n Gps*	*Notes*	*Dis'n Gps*	*Notes*
K-1	33	87	35	74	68	161
2-4	36	109	26	125	62	234
5-6	34	78	26	72	60	150
Total	103	274	87	271	190	545

In general two researchers worked in a school, holding discussion groups over a period of 3-4 days. Discussion groups lasted from twenty to forty minutes, depending on the age and number of children involved. Discussion groups usually had six children of both genders. Questions used varied over time as issues emerged or questions were deleted or refined.

All sessions were videotaped and complete transcripts of the sessions were generated. Children's responses were coded, by three researchers, based on the question asked or, in some cases, the answer given, as children often provided a rich variety of information within the one utterance. Reliability of the three coders was monitored through cross-checking.

Results

Both parent surveys and children's discussions were analysed. Some frequency tables were generated for the parent surveys and frequency ratings were averaged. These averages were used an index of frequency of use as appropriate.

The analysis of the children's discussions was mainly qualitative with some simple frequencies generated for categorical responses such as location of computer and use by family members.

PARENTS PERCEPTIONS OF PATTERNS OF USE

Five hundred and forty five parents returned the surveys from the three schools. About sixty five percent (n=350) of the parents indicated that their children used a computer at home. About twenty five percent reported that their child used the computer once a week or less and about forty percent indicated that their children used the computer several times a week or more.

Table 4 displays the frequency indexes for the whole range of activities for those children whose parents reported that they used a computer at home. It is clear from the table that television watching is still by far the most common activity for these children. In fact only one parent indicated that their child watched television less than two or three times a week and they reported that the child did not watch television at all. Parents also reported that the amount of TV watching was constant across ages.

Table 4

Frequency Index for activities using a range of electronic media

(N=350: children whose parents reported that they used a computer at home)

Activity	Frequency Index
watch television	4.3
listen to their own music	2.3
use the telephone to talk to friends etc	1.5
play games on a games machines	1.4[1]
play games on a computer	2.1
use a computer for writing and /or drawing	1.2
use a computer for school projects and homework	0.6

[1] Not all children who had access to computers at home had access to video games machines as well.

There were, however, age and gender differences with most uses of the other electronic devices. Parents reported that their daughters used the telephone and listened to their own music slightly more often than their sons, and their sons played games on video-games machines and computers more often than their daughters.

Game playing and all activities using the computer were reported as steadily increasing with age. Of interest, however is that while parents reported that using the computer for writing and homework increased with age, there were no gender differences. On the rare occasions that parents reported that children used the computer for uses other than games, writing and homework they reported activities such as making cards, posters etc, playing educational games, learning or practising typing, using CD ROM- based encyclopedias and learning maths.

About twenty five percent indicated that their child used the computer for a variety of tasks, while forty percent reported that their child mainly played games.

No differences were found between the responses of the parents from each of the schools. On the whole parents reporting was consistent with children's responses. Direct comparisons were not possible as, in the discussion groups, not all children answered all questions.

CHILDREN'S PERCEPTIONS OF COMPUTING EQUIPMENT IN THE HOME

The one hundred and ninety children interviewed had been selected because their parents indicated that they were regular users of home computers. A small number of children interviewed stated that they did not have a computer in their home but reported that they regularly used computers in other homes eg. cousins, friends. All other children confirmed that they did have a computer in their home. About twenty percent of the children reported that their was more than one computer in their home. Some of these were portable computers (e.g. laptops) that parents brought home from work: *"yes 3, we have a CDRom one and two laptops that belong to my mum and dad's school but they keep them at home ...."*. Others were earlier models which were basically discarded or no longer worked: *"We have a Commodore 64 which we never use and a business computer - an IBM which is my dads"*. A smaller number of children had two or more working computers in their home: *"I've got two, an old one and a new one that my dad uses for work"*.

Asking children to describe the computer in their home prompted an amazing variety of responses. Younger children tended to describe the computer in terms of what software it has

or what they do with it The following comments from kindergarten children were typical: *"I play game and do drawings on it. I draw houses"*; and *"My computer has treehouse. there is some paintings and cars and bears too. You can play anything else"*. Consistent with naming software in the description a small number of children described their computers in terms of the operating system: *"My computer's called 'Windows' "*.

The Grade 5 and 6 children were more likely to describe their computers by brand or model, with boys giving slightly more detail than the girls: *"Mine is a 386DX2. We don't have a sound blaster. Just the one hard drive and a monitor, And the hard drive is separate, not like that one there. It's like separate there and the monitor is there"*.

About seventy percent of the children responded that they had a printer at home. Several who didn't were able to describe other strategies for printing: *"No, my dad prints it at work"; and "No, but I use my cousins"*. An older child replied: *".....don't have a printer. I'm sure I'll get one for when I'm in high school"*. CD Rom drives seemed less common, with only twenty percent of the children mentioning one. Modems in the home were rare. Only seven children reported that they had one at home and all but one of these linked it to work related activities of a parent: *"Mum has one she's the president of an organisation. Only mum can use it"*. Only one child reported using one: *"I have a modem and I sometimes use it with my uncle. It is not good to copy games you wreck the disk and the computer"*.

CHILDREN'S PERCEPTIONS OF ACCESS TO COMPUTING IN THEIR HOME

A range of factors influenced how much access children have to computers in their homes. Some of these factors were explored in the discussion groups. These included location of the computer, ownership (who 'owns' it and who uses it most), and rules about its use. Each of these is discussed below.

Location

Computers can be found in most spaces in the home. Children reported that computers were located in spaces such as living / loungerooms, dining rooms, family rooms, studies/ offices, bedrooms, granny flats, garages, the sewing room, and interestingly a space which eight children labelled a computer room: *"...my father calls it the computer room - both computers are in there"*. It was obvious from a small number of comments that many families have had to make a space for the computer: *"one's in my brother's room and we are trying to find a*

spot for the other one - it's in the dining room at the moment, but we are trying to find somewhere to put it".

About forty percent of the children named a bedroom (own, parents, brothers, sisters, and spare) as the place where the computer was kept. An equal number named more public spaces such as the living room. About fifteen percent of the children named a space such as a study or an office, with most providing comments such as *"in mum's office";* or *"in the office where mum and dad work because they sometimes work in it".* In general, when describing other people's bedrooms as the place where the computer was kept, the number of brothers and sister's bedrooms seemed reasonably equal, however there was a major gender difference in reporting "my bedroom". Of the ten percent of the children who named their own bedroom, sixteen were boys and four girls.

Sometimes when the computer was in someone else's room the children clarified the issue of access or control: *"..... keep it in my sisters room but I use it too ";* *"in my dad's room because if its in my room my brother would come in and do what he wants on the computer....";* and *"mine's in Dad's office so I can work without anyone bugging me".*

Ownership

Two different approaches were used to further address the topic of access. Children responded to questions about who they thought owned the computer and who used it most.

The children reported that the computers in their homes were more often individually owned than shared within the family. Only about twenty five percent of the children reported shared ownership with comments such as *"All of us"; "mum, dad, my brother and me";* and *"me and my sister own the one with the most games.....".*

Dads were by far the most commonly named individual owner of the computer (about twenty five percent). About twenty percent of the children named themselves. More often than not, these were boys. Mothers or siblings were each named about fifteen percent of the time, with brothers and sisters receiving about equal mentions.

Interestingly when the children were asked who uses the computer most in the family about thirty five percent named themselves. The gender ratio in this group slightly favoured boys. The significant gender differences came as twenty percent of the children named their dad as

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the person who uses the computer most and another twenty percent named their brothers. The remainder named their sisters, and in a few cases their mother or both parents.

Rules

Rules about use of computers also had an impact on children's access to computers. In discussions about rules, it became obvious that there were many different types of rules about computer use. These included more general rules about how they used the computer and rules directly related to access.

General rules about operating the computer covered a wide range of issues, caring for the computer, use of the printer as well as those governing security or privacy of others files. They were, by far, the most commonly volunteered rules. Typical rules about caring for the computer included not eating and drinking near the computer, nor banging the keyboard: *"don't bang the keyboard, no drinking around the computer because you might wreck the keys, you might spill the juice in the keys and the keys might break"*. Many younger children also had rules about what they can do by themselves and what they need help with: *"I'm not allowed to put the disk in myself and put the game on. Mum does if for me?"*; and *"I'm not allowed to print by myself. My two sisters help me"*. The latter have a direct impact on access, particularly if help is not readily available.

Few children mentioned issues of privacy or security of programs or files. When doing so it was mainly in relation to their father's work files: *"Don't have the computer on when we have friends or visitors because of dad's files"*. Others mentioned these issues as more generic rules about loss of programs: *"...you can't put nothing in the rubbish bin, no games and if the rubbish bin is fat, the disk may come out but only for mum and dad it will. .... my sister and brother did once try to put a game in the rubbish bin "*.

Rules directly related to access covered issues such as when, how often and how long children could use the computer, types of use, who has priority use and how disputes were resolved. Only a few children mentioned explicit rules about when, how often and for how long children could use the computer: *"I'm only allowed to use it on holidays and weekends"*; and *"I have a time limit of an hour"*. Some of these children also described rules that differentiated the types of uses: *"I'm only allowed to work on it when I've got my school project or some work I have to do at home. I'm allowed to play games on the weekends only"*; and *"We can use it for 15 minutes for games, but if it's homework we can have as long as we need"*. More

commonly children described rules that indicated that there were priority users and uses within the family. Parents doing work on the computer and older siblings doing school work seemed to have clear priority: *"We have to get straight off if mum or dad wants to do something"*; and *"If my sister's on it I have to wait because she's doing her HSC..."*. Homework or school work had priority over games: *"I tell my brother to get off because I need to do homework, study or typing or printing. He goes off and goes and watches TV or just something else.."*.

Issues about turntaking and disputes seemed related more to game playing that other uses on the computer: *"If we fight over the computer no one is allowed to play it."*. Many children mentioned strategies that parents used to regulate fair use. Time limits, turntaking, playing two player games were commonly mentioned, so was the notion of not being allowed to fight about who should have access: *"If we fight the computer goes off. We always keep a watch next to the computer"*.

A number of children did volunteer examples of difficulties with disputes over access. Interestingly these were provided mainly by girls (of all ages) but they were not always aimed at brothers! The following statements provide a range of situations: *".....he never lets me on. When he's busy I tell him "After you can I have a turn?" by then its probably tea time and I have to go to bed so he never actually lets me have a go"*; *"sometimes I'll be playing games and my brother (OLDER) will just push me off the chair"*; *"my older brother and sister use it more. If I want a go they stay on the computer but if I want a turn they just come on"*; and *"Whenever I want to play it when Lucy's(OLDER SISTER) playing it, she's 9, turning 10 in a couple of weeks, I ask dad if I can have a go next and he says "we'll see". And I go over and I watch Lucy and she's always playing Marjhong which is a game with finding the same tiles and you .... It's always at night time and dad says "All right you can have a go after Lucy's finished this go". And I go "Lucy can I have a go?" and then she starts typing some stuff and I say "Lucy, it's my go" and then she just pushes me away. So I tell dad and he makes Lucy get off and I get my go...." (NB: alias used for sister's name.)*

It is interesting that the Lucy, the older sister swapped from playing to typing in order to increase her chances of staying at the computer. This strategy suggests that their were some types of rules about priority uses within that home.

PARENTS AND SIBLINGS USE OF COMPUTERS

As mentioned earlier about forty percent of the children named their father or their brother as the family member who used the computer the most. In general discussions about which other family members also used the computer at home children tended to report that the whole family used it. On the rare occasion that a child reported someone in the family not using it, it was likely to be the mother, both parents or a baby brother or sister: *"...my mum hasn't used it yet because she has other stuff to do "*; and *".... my parents don't use it because they don't know how"*.

When discussing what family members used the computer for the children reported two main types of use - work, related to employment or school, and games. A range of other uses were also mentioned including work for voluntary organisations, household work e.g. budget, study at college or university, homework/schoolwork, printing (cards, banners etc) and typing (often referring to letters).

When talking about parental use, dad's work was the most commonly mentioned task, being mentioned twice as much as mum's work. A small number of children described how both parents used the computer for work: *"well my mum normally uses it for her work, for her essays, sort of thing - like assignments because she works in a tax office (name of the office removed) or something like that. And she always has to do stuff because they know she's good at computers. My dad uses it for the army....."*. Children mentioned a wide range of occupations when talking about their parents using the computers for their work within the home. These included plumbing, sales management, insurance, engineering, teaching, armed forces, taxation, retailing, police work, computing, graphic design, airline work, hotel management, sales and community home care. A small number volunteered descriptions of the use: *".....my dad's a plumber, he works. And if he works at someone's place, like if there's a blocked drain or something, well they put that on the computer. And if they don't pay for it being done well they have to go and tell them because he went and did it for them"*. A small number of children also mentioned that their mother typed up work for their father: *"mum types up work for dad who is a sales manager"*.

A number of children identified computer use with their parents' further study: *"my dad does lots of work on it because he goes to study at university"* and with work in voluntary organisations: *"my mum uses it for typing letters for football"*. Not surprisingly younger children were more vague in their descriptions of how their parents used the computers:

"...they can do jobs and writing"; "...they do some work on it.."; and *"they use them to write..."*.

Many children made references to one or both of their parents playing games. About an equal number of mentions were made of mothers as of fathers, particularly with reference to the types of card games, that come with system software, such as SOLITAIRE. Apart from one reference to TETRIS only fathers were named as playing games that would be separately purchased such as SIM CITY, GOLF or PRINCE OF PERSIA: *"mum plays games like SOLITAIRE and other card games and dad plays driving games .....- the super video car game."*. A small number of younger children mentioned that their mother of father played games with them or helped them learn to play games: *"My dad helps me learn some games"*; and *"I play games with my mum"*.

Only two children described a parent in a way that might indicate that they were a computing hobbyist, both were dads: *".....he just makes them up from other games ... uses the same characters and all that but he sticks the game and compacts it and makes a couple of levels in it and all that.... he doesn't sell them because you are not allowed. Mostly he deletes them and all that because he doesn't want them to get sold. He keeps them on a disk..."*. While the other comment was a shorter reference to a father's use of a modem: *"...dad uses it .....to talk to his friend with the modem"*.

- When talking about siblings' use some clear patterns emerged in the children's responses. Overwhelmingly, older brothers and sisters use the computer for tasks such as college or university work, school work, home work, and projects: *"My sister uses it for homework because she is in high school"*. Again, as with parents, gameplaying was the second most common response, though little detail was volunteered: *"...my brother also plays games on it.."*. When talking about younger brothers and sisters 'playing' as well as playing games was mentioned: *"..she's four in December, She just plays. She types but she just presses anything..."*.

CHILDREN'S OWN USE OF COMPUTERS

Overwhelmingly the children reported that their most common use of the computer is playing games. Drawing, writing, making things, and doing school-related work all come a far second. Each of these uses will be discussed in greater detail below.

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PLAYING GAMES

As mentioned earlier, both the parents and the children reported that the children's most common use of the computer was game playing. As well, many of the children also play games on dedicated games machines, such as Super Nintendos and Segas and on hand held machines such as GameBoys. In many of the discussions about game playing it was difficult to separate the different game-playing environments, although a small number of older children did differentiate: *"I play the Sega much more than the computer. I would say I only use it (the computer) once every two weeks,...I play the Sega more like once a day..."*. In the following discussions game-playing is treated as a single activity, regardless of the environment.

A further complication stems from the children's generic use of the term "play" and "games". As mentioned in previous sections children use this language to describe a wide range of computer uses. Some of this more general type of talk was evident when children were talking about playing games. For example, when talking about their favourite game, a number of children mentioned KID PIX or other types of programmes that enabled children to draw or paint.

Frequency of Game Playing

The frequency of the children's playing varied from every day to once a week, although a very small number indicated that they rarely played games. Some children mentioned restrictions on their use. The reasons behind these restrictions varied from *"I go in phases. It depends how often mum brings home the laptop....."* to *"...like Monday and Tuesday's is my brother, Wednesday and Thursday is me and Friday and Saturday is my Dad..."*. Duration of play also varied enormously among the children from several hours to about ten minutes. In discussions about duration a number of children mentioned that duration of particular sessions also varied greatly: *"I don't know how long I play with it because sometimes if I'm playing a fighting game and they kill me, I get really angry and I just turn if off .."*. Some mentioned the fact that some games take a long time: *"..with Monkey Island, it takes ages so I do it for about 2 hours every day"*. Other children mentioned some restrictions: *"usually one hour. For homework I get overtime. Other times 20 minutes ..."*; and *"...it depends if others are waiting to use the computer. I have a time limit of half an hour .."*.

Only ten children reported that they played for several hours every day, all but one of these children were boys in the eight to twelve age range: *"Most of the time, once of a morning and*

three times in the afternoon. Every day. Sometimes I play it until I finish a game no matter what. Sometimes I play through tea without having any tea or breakfast. ...1 to 2 hours but sometimes of an afternoon I play for 5 to 6 hours ".

Type of Games Played

Overall children mentioned more than 60 different games when they were describing their favourite game. No one game was outstandingly popular. A small number of games were mentioned by several children. These included KID PIX (as discussed earlier- this is not a game), TETRIS and STREET FIGHTER. There were gender and age differences in choices of favourite games. For example, KID PIX, AND ROGER RABBIT were only mentioned by younger children, TETRIS was only mentioned by older girls and games such as STREET FIGHTER and MORTAL KOMBAT were only mentioned by older boys.

OTHER USES

As well as playing games the youngest children reported that they colour in and draw, and write stories and letters. There seemed to be little gender differences. Few of the these children volunteered much detail about their activities. Many who did, used the terms 'play' and 'game' in their descriptions whether they are using the common tool software or programs specifically designed for early childhood that have 'play' or 'game' contexts embedded within the software: *"I can play PAINTBRUSH and print my favourite pictures"*; and *"...I print out my fairy games. I can print every game what's on the computer. I have to print it by myself. And sometimes I know how to send it out. And if I make mistakes I just rub it out and do it again. You get the soap and then you click on it and move it and where you made the mistake, you click on it again and it rubs out.....".* For one child this carried over to his use of electronic stories: *"..I play books...".*

Children in the middle years of primary school also began to mention homework in their descriptions of what they did. Again there were no discernible gender differences. Some gave detailed descriptions of how they did their spelling or tables, while others only volunteered the term 'homework': *"...Like I do my spelling. look, cover, write, check. I look at the word, then I cover it, then I write it on the computer and then I look to see if it's right and if its not I go right back and "rub it out".....".* A number of children also mentioned 'looking up' information or 'finding things out' but without specific references to particular electronic

texts or software e.g. encyclopedias. The language of 'play' still persists in some children's descriptions of what they do. As well a number of the children seem to use the term 'typing' interchangeably with 'writing'.

Children in the final years of primary school make many more references to projects and homework, to using encyclopedias and to completing writing begun at school. Few children mentioned drawing as a use, apart from graphics, pictures and title pages within projects. A small number of girls did refer to designing things: *"..well sometimes I just sit at the computer and I like designing my own flags, like the Aboriginal flag and doing different sorts of backgrounds..."*. Another girl spoke of SIM CITY in terms of liking design: *"I like going into a thing called Sim City. I like designing things like that. You build your own cities.... and you go into a thing called evaluation and it tells you how many people the city has. And it tells you the thing that's happening like it might be pollution....."*.

A number of points of interest arose from these older students more elaborate responses to their uses. The first was that a small number of older children were still using 'play' and 'game' terminology in their descriptions of use: *"...I like playing Kid Pix and Magic School Bus and..."*; and *"...there's games like Encarta...."*. The second was that some children were 'playing with' information in a serendipitous way: *"..Well we got this atlas. And I like going into that and you pick your countries. And you bring it up and they show you the flag and you can play the anthem ."*

A third set of points related to the using the computer to do school-related projects. For most children doing a project involved moving back and forwards between screen and paper. Some children reported using paper-based sources of information: *"...first I get the information out of a book, write it on a piece of paper, type it out on the computer, and then print it out. I stick it on cardboard to hand it in to the teacher"*. Other children began with an electronic source but completed the project by hand: *"I get information from the CD Rom and type up the information and print it and then put it in my own words"*. Some others read from an electronic source then organised the information on paper, before returning to the computer: *"First I go to Encarta, print out the information, read it, put it into my own words, shorten it from 6 pages to 3 pages, type it into different paragraphs, print it out, print pictures through the large screen and then put colour cartridge to print (the pictures) in colour"*. This pattern of moving between screen and paper was also mentioned within the context of completing projects as school: " *At school.....we print out what we need and then we go back and write*

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out our own copy and them we go back and type it on the computer...and we get the pictures as well". Only one child described a process of working with an electronic text the whole time. i.e. copy the text from an electronic source straight into a word processor, where they read, reorganised and wrote in their own words.

A number of children described how they used pictures, and maps from electronic sources in their projects and images from clip art collections for title pages. The issue of copyright of pictures within encyclopedias was mentioned by two children, as was the notion of creating a bibliography to name the sources of information. However, it was common for children to mention changing the texts into their own words: *"....you can just look at it and change it into your own words"*.

LEARNING TO USE COMPUTERS

The children reported a variety of ways that they learnt to use the computer. The most common processes were direct instruction, experimenting and watching others. A small number of children also mentioned using manuals and help files. A small number of children mentioned school or teachers when they described how they learned. Two children reported that they couldn't remember it was so long ago!

Direct instruction was mainly from parents, especially dads, older siblings and in a few cases from the computer vendor. Younger children, in particular, mentioned this process. Children of all ages, however, reported that they had learnt/taught themselves: *"I learned by having a fiddle around"; "I just pressed the buttons"; "I did it all by myself, I played it, I just know it"*; and *"I just picked it up by having one in the house"*. One child described the process in detail: *"with one of my computers, my first one I got when I was pretty young .....And I learnt that you could fiddle around with it and it wouldn't break so I just kept pressing all these different buttons ....."*. An older girls described it this way: *"if I am playing an educational game or a video game, I'll just take risks because I want to see what happens"*.

Many children also reported watching parents and older siblings use the computer: *".....when my dad played I just watch him so I just copy him and I remember in my mind"*; and *"I just looked at my mum and how she used it"*. In particular younger children watch other children play games: *"...my cousins play and watch until I get the hang of it"*; and *"...I play games and watch my sister play"*.

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When describing how to learn to play games a number of older children referred to reading instructions and manuals: " *When you buy a game you just play along and I usually read the instruction book....* ". Some children reported that they only use the manual after they have tried to work it out for themselves: *"Try and go through it and if you get stuck you go and get the manual"*. One child explained the role of previous experiences: *"You like take the experience from another game and you just fiddle...* ".

Many children mentioned a combination of learning processes. A few older children differentiated their learning processes by type of use: *"Dad showed me the keys for WordPerfect. Dad showed me the function keys F1, F2... and how to use the help screen, he wrote them down for me. And for games I just practiced.*". A number of children, while not referring to the processes used mentioned playing games as the way they learned to use the computer "*.....from playing games on it*".

USING COMPUTERS AT SCHOOL

Computer usage in schools is dependent on the type of access which the school and the individual teacher provides. Each of the three schools has their resources organised in different ways. One school has a computer room with approximately 15 computers and printers. A few classes also have a computer in their room. The second school has 8-10 computers with CDroms in the school library, one computer in each classroom and others on movable carts which can be brought to the classroom. The third school has one computer in each classroom and two in several senior primary classrooms. It is interesting to note that regardless of the setup at the school the children's responses to a number of topics were similar across the three schools.

Most children reported that they do use computers at school. Those who said that they didn't were more often than not in kindergarten. No gender differences were found in the children's access to computers. However, some children, both boys and girls, expressed concerns such as: *"The boys take the computer"*; *"All of the boys want to have a go and they're not letting the girls have a go.."*; and *"Normally all the boys go on before the girls go on"*.

The children reported that they used the computers at school for a variety of purposes. The most common uses were playing games, writing stories and publishing, and using CDroms to obtain information. Additional uses were printing, painting, word processing, typing, and doing projects. A number of children descriptions of what they used the computers for were

very vague *".....School things"*. Most children who mentioned games, did not elaborate about the subject of the game though some of the older children used terminology such as 'educational games' and 'computer games'. One older child did attempt to explain the difference: *"We've got like this little page here and that's the Main Menu. And in the Main Menu is the Social Studies ones. Like they're also games but they're challenging. There's Maths and Science and they're all in a different category. So if you want Social Studies you can do Ancient Empires and all other games. And there's only one little Games directory which has got nothing to do with it, like there's no problem to solve or anything. And that Games directory contains Crystal Caves, Secret Agent and games like that. Social Studies (educational* games) *- there is a challenge in them also but it's also a game to play for fun so it's like a mixture)"*.

The boys were more likely to say they "play games" than the girls. One student said that he *"plays writing games "* at school.

Many of the children reported that ten to fifteen minutes is the usual duration of a turn at the computers. Some children expressed frustration: *"there's lots of people and you only get a short time on it "*. Frequency of use varied from twice a week to one or two times a term. A number of children described how their teachers used rosters and lists to ensure equal access: *"Mrs X in the library has a roll of the class and she ticks off if you had three goes and whoever hasn't had three goes gets the next turn"*; and *"Two go at a time.. everyone has a number and we get turns ... "*.

Some children reported other methods that teachers used to determine access. These included, selecting children who finished their work early, children who were well behaved and those who asked. Some of the children volunteered comments on the results of these types of approaches: *"Mrs X lets you go if you've finished your work or if we're having free time....yes... normally all the boys go on before the girls go on. Well yes but they're only 10 minutes behind or 5 minutes behind so you don't get very long on the computer, it depends because some peoples are better at spelling and handwriting and the others are better on maths, so it just depends. So everyone gets about two goes a week nearly"*.

A number of children said that they did not get to use the school computers much at all. They focused on the issue of access. Some of the younger children, both boys and girls, perceived that the computer was controlled by 'others' and they had been denied access: *"People keep taking my turn - they just don't want me to get a turn. They keep playing it"*; *"The teacher*

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doesn't let us do it because we might do the wrong thing"; "Some people have had a turn but she always picks the same people"; "I haven't had a turn at school yet because the teacher won't let me (514"); and *"You put your hand up and the teacher picks somebody. When I play with Sarah she has all the turns, she is really bossy".*

About a third of the children stated that they preferred to use the computer at home. Their reasons focused on having more time at home, more choice of what to do and the quantity and quality of games at home: *"At home you have as much time as you want"; "You don't have to share and there is no time limit";* and *"I think it's much easier to work at home - it just comes natural ... At school it has to be forced out of you. You have more time to think at home".* Children spoke about distractions from classroom noise and other children watching them.

Perceptions of the differences between using computers at home and school also involved using them for different purposes eg. games at school and assignments at home (or vice versa), different types of computer equipment (older/newer, brands, colour/monochrome, printers, CDroms, screen savers) and the selection of games that are available on them. Older students were able to discriminate some difference between recreational games and educational games but it did not affect their enjoyment of computers and computer games at school: *"they're completely different games"; "there is more school stuff than games on the school computer".* Other children commented on the lack control over the school computers: *"you can't put new games on"; and "you're not always allowed to print at school".*

Discussion

The results of this part of the study clearly indicate the extent of integration of the computer into the home lives of these children. Children spoke in a matter of fact way about a wide range of issues associated with their access to and use of the computer or computers in their home.

Two of the important facts to emerge from the study were that around twenty percent of children came from homes which had two or more working computers and that particularly with the younger children, several had had computer/s in their homes for as long as they could remember. This latter fact is particularly significant for schools who need to face the challenge of the coming generations of children that have been or will be born into a world of computing.

Two important issues also emerged with relation to children's access to the computers in their home. Firstly a significant number of children regarded themselves as the 'owner' and/or the person who most often uses the home computer/s. While there appeared to be some gender differences in this perception, with the number of boys placing themselves in this category being greater that the number of girls, the differences were not as large as was expected. In many children's families the computer was owned and used by all or most members of the family. In others, dads were perceived to be the owner and main user of the computer.

Secondly, while the location of the computer varied enormously from private places (another's bedroom) to public places (the family room), most restrictions to access came about because of the existence of priority users and uses: Adults and older siblings had preference over younger users as did 'work' over 'games'. In some families these rules were sufficiently explicit that some children were able to manipulate them to gain greater access. Few children complained that they did not get enough access to the computer, although a small number did mention disputes with siblings. In fact when comparing school use to home use, many children identified the factor of access as a key factor in their preference for home computing.

Children described a variety of ways that they used the home computer. Not surprisingly playing games was the most common use. Very few children appeared to be 'addicted to' game playing in the sense that they spent too many hours playing. On the other hand, many children identified game playing as one of the ways they developed their confidence and competence with the computer. The language of 'playing' and 'games' permeated children's talk about computers, for some, even when they were referring to other uses such as writing, drawing or reading electronic books. As well the strategies of 'trial and error', 'fiddling' or 'playing around' when learning new games also seemed to extend to the task of learning to use other types of programs and system software. Combined with some direct teaching from a parent (usually dad) or sibling and the strategy of 'learning by watching', most children were confident in their ability to learn how to use new software or new processes associated with using the hardware.

As well as providing direct instruction for the children parents and siblings also played a number of other important roles for children in their home computing. The most important of these was as role models. Not only did children spend time 'learning by watching' they also enjoyed the spectacle of watching others play games, and at times playing games with

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others. In addition, children perceived that both parents and older siblings mainly used the computer for 'work'. Such a perception may help balance the media and advertising influence that portrays game playing as a dominant use of computers for children.

As well as playing games, most children used the computers in other ways as well. These included school-related activities as well as a range of self-generated tasks such as making cards and writing letters. About twenty percent of the children, mainly older ones, spoke about using CDRom-based electronic texts, such as encyclopedias. It is important to note that, at this point in time, telecommunications does not feature at all in these children's use.) When working with electronic texts, children seemed very comfortable with the processes of moving between paper and screen. tasks that worked on at the computer.

There was great variety in the amount and nature of the school-related tasks that children undertook using their home computer. The tasks are in large part influenced by the type of homework and extended project work that teacher set for their class. A number of children commented that they did not get the type of homework that could be done using a computer.

When children spoke about using computers as school, the language of 'playing' and 'games' was again prevalent. Many children initially described school uses solely in terms of playing games. Only after further questioning did more differentiated descriptions emerge. A key issue to arise from children's descriptions of their school use was access. This is not surprising given the difference between home and school access. As well children differentiated between school and home on other factors such as perceived control over access and use, the modernity of the equipment and the range and types of games. It is not surprising that often the home environment was seen as more favourable by the children.

NEXT STAGE OF THE RESEARCH

In order to seek clarification of many of the issues raised in this stage of the research a further 250 structured interviews have occurred with children in eight Sydney schools, across wider range of socio-economic and cultural backgrounds. In each school (or partner school) equal numbers of boys and girls in each of the upper four grades (Yrs 3-6) were interviewed. Again, children were selected based on the information provided by parents that indicated that the child was a regular user.

APPENDIX A

Results -of aggregated responses to the teacher surveys in 1994

an extract from Downes (1995) Children and Electronic Media: The Home-School Connection. in Tinsey. D. & van Weert, T. Liberating the Learner. Proceedings of the World Conference on Computers in Education, Birmingham UK, 1995. London: Chapman & Hall. pp 543-553.

In the first part of the study there were 17 teachers and 460 students. In describing the school community eight teachers reported low socio-economic status and nine reported middle socio-economic status. In general schools had high populations of children from language backgrounds other than English (LBOTE). For the purposes of analysis the children were placed in two grade groups - younger children (5-7 yr old students) and older children (8-12 yr old students).

CHILDREN'S ACCESS TO TECHNOLOGIES

As reported in the literature there were technologically affluent and poor families within the communities surveyed. At one end of the spectrum 53% of families owned television and telephone plus three other technologies and 37% of families owned both computer and video games machines. At the other end of the spectrum 3% of families owned no other technologies beyond television and telephone, 5% of families owned neither video recorder or video games and 18% families did neither computer nor video games machine.

There were also age and gender differences in a number of areas. Family ownership of computers and video games increased with the child's age. Gender differences were mainly related to video game ownership. There were no gender differences in family ownership of computers.

CHILDREN'S USE OF TECHNOLOGIES

Table 2 displays the percentages of children who reported that they used these technologies in the home. While reported usage was high, less that 5% of the children responded that they used any of these technologies for purposes other than entertainment.

Table 2 Children's use of electronic technologies.

Technology	*Use*
television	100%
telephone	80%
video recorders	70%
video games	50%
computers	45%

There were age and gender differences in use. Younger children only used the video recorder for entertainment. Although older boys were are more likely to use video recorders than older girls, they are less likely to use it for purposes other than entertainment.

Boys were more likely to use video games than girls and the gap between the usage widened with age. In classes where teachers asked the students to talk about the games they played, or to name the games, further gender differences emerged. Boys could name and discuss a far wider range of games, most of which were games of aggression. Girls named few games, some could not remember or didn't know the name of the games they played, and in all but one case named or described games of adventure or sport. These games were also on the boys lists.

There were age differences in computer use. 33% of younger children and 55% of older children reported usage. About 10% of all children reported that they used their computer for purposes other than games, for example homework or making cards. There were no gender differences.

APPENDIX B

A brief review of literature

A literature search on the topic of children's use of media in the home revealed some interesting findings.

Firstly, very few studies focus on children from five to twelve years of age. Research with young children in the home is usually related to print literacy and occasionally television. Studies that concentrate on electronic or mass media tend to focus on adolescents and young adults [1]. Even the recent Times- Mirror study in the US [2] that focused on technology in the American household defined 13-17 year olds as children. The recent ABS study [9], while providing information for families with dependent children across the age range, used 5-9 years and 10-14 years as their categories, only interviewed adults about access and use in the home.

Secondly few studies address children's perceptions of the growing gap between home and school technologies. Almost all studies are concerned with the impact of these technologies on children's behaviour [1] [3]. Many stem from concern about addiction to viewing or playing these devices or concern about the effects of violence and stereotyping on children's attitudes and behaviours. While these concerns are real, few researchers have asked children their views on these important matters.

Thirdly there is little if any Australian research beyond investigations of children's attitudes and use of computers. On notable exception is the work of a Deakin University group who have been bold enough to ask the question "Are their Aliens in our Classrooms?" [4]. This work, however has focused on adolescents.

The following sections summarise some of the important international findings in the area of access and use and some of the implications directly related to schooling.

ACCESS AND USE

Most of the findings on access and use, confirm the belief that electronic media are natural ingredients of children's lives [1] [2] [3]. As well as television, video, electronic games (video, computer and hand-held) and computers, there is also a significant component of listening to

music through stereos, walkmans, and music videos [1]. Television still dominates children's lives. Patterns of family life and children's leisure have also changed significantly over the last 20 years. Leisure activities such as reading and outdoor and indoor unstructured play have decreased, but not necessarily in direct response to access to electronic media in homes [5].

Patterns of access and use vary according to geographic region, the socio-economic status of the community and family, and the child's age, gender, and peer culture [2] [6]. The Australian Bureau of Statistics study [9] reveals that about 20% of Australian households own one or more computers. Some preliminary research with primary- aged children, living in south Western Sydney, suggests that the family ownership of computers, is closer to 50% [10].

In many ways the advent of electronic technologies in the home is further widening the gap between rich and poor, powerful and marginalised, literary cultures and popular cultures, generations and genders.

FAMILY COMPUTING

Few studies investigated the family home as a context for children's computing. One notable study by Giaquinta et al [11], followed seventy families patterns of use over a three year period from 1984-1986. They investigated children's educational and recreational uses of computers. They revealed a near absence of what they described as academic computing (using computers to learn school-related content and skills), only modest amounts of programming and word processing and almost no telecommunications. They found that game playing took up most the children's computing in these families. More importantly, the study made a significant attempt to identify the sources that influence children's use of the home computer.

As with the many studies of adult's uses in the home from that period, programming was still a significant feature of the environment. As well the Giaquinta study was situated at a time when there was a strong notion that schools could and would be replaced by children learning from computers in their homes, hence their emphasis on 'academic computing.'

RELATIONSHIP BETWEEN HOME MEDIA AND CLASSROOMS

A number of research studies have focused on the relationship between home media and classrooms. Some findings include: children's views on computer use at school are shaped by

home experiences [7] [8]; metaphors and images found in games extend to real and classroom life [3]; and excessive game playing is linked to poor academic performance [1].

Overall the literature poses more questions than answers. However, it does suggest teachers need to pay serious attention to a range of issues. It also clearly identifies a significant gap in our understanding of the experiences and perceptions children bring from their electronic world outside the classroom to their classroom world of learning.

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